FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 665 (No. 38, Vol. XIII.) SEPTEMBER 22, 1921 [Weekly, Price 6d. Post free, 7d.

Flight

The Aircraft Engineer and Airships

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C.2.
Telegrams: Truditur, Westcent, London. Telephone: Gerrard 1828

Annual Subscription Rates, Post Free

United Kingdom .. 30s. 4d. Abroad .. .. 33s. 0d.*

These rates are subject to any alteration found necessary under abnormal conditions and to increases in postage rates

* *European subscriptions must be remitted in British currency*

CONTENTS

DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

Oct. 1	**Coupe Deutsch de la Meurthe**
Oct. 22–30	**Aero Exhibition, Prague**
Nov. 3	**Lecture, "Manœuvres of Getting Off and Landing," by Sq. Ldr. R. M. Hill, before R.Ae.S.**
Nov. 12–27	**Paris Aero Salon**
Nov. 15–26	**International Air Navigation Congress (Paris)**
Nov. 17	**Lecture, "Requirements and Difficulties of Air Transport," by Col. F. Searle, before R.Ae.S.**
Dec. 1	**Lecture, "Design of a Commercial Aeroplane," by Capt. G. de Havilland, before R.Ae.S.**
Dec. 15	**Lecture, "Development of the Fighting Aeroplane," by Capt. F. M. Green, before R.Ae.S.**
1922.	
Jan. 5.	**Lecture, "Specialised Aircraft," by Wing-Com. W. D. Beatty, before R.Ae.S.**
Jan. 19.	**Lecture, "Aeroplane Installation," by Brig.-Gen. R. K. Bagnall-Wild, before R.Ae.S.**

EDITORIAL COMMENT

THE full text of the report of the U.S. Naval and Military Committee, appointed to carry out experiments in bombing from the air certain ex-German warships, does not carry us any farther than the telegraphic summary upon which we commented some weeks ago. It is quite negative in its conclusions, and the Committee appears to have suffered, if we may so, from some little confusion of thought. It is obvious, from certain parts of the report, that they conclude that aircraft are of little value for the direct attack of capital ships. Yet they speak of aircraft having a possibly decisive effect upon coast defence operations. Again, predicating the uselessness of aircraft, the Committee expresses the opinion that "it has become imperative as a matter of national defence to provide for the maximum possible development of aviation both in the Army and the Navy." And there we will leave it, merely remarking again that the report does not carry us very much nearer to a theoretical solution of the problem of aircraft in naval war.

Aircraft in Naval War

Admiral Lacaze, formerly French Minister of Marine, discussing the question of the big battleship, recently pronounced in favour of building capital ships, since, in his opinion, the future freedom of the seas will only be secured by squadrons of big battleships. The submarine can, he thinks, never be more than a menace and an annoyance—the decision will always rest with the battle fleets. As to aircraft, he is of opinion that the aeroplane armed with torpedoes will undoubtedly have great influence in future naval battles, although this importance may be somewhat exaggerated. In all experiments of bombing ships by aeroplanes made in the French Navy the percentage of hits was very low. It is, he says, nevertheless obvious that the development of aviation must be duly considered in the preparation of naval programmes.

From the point of view of the one who is not a naval "expert," it would seem that high authorities are somewhat prone to take their lessons from the past without giving due weight to the probabilities of the future. If we could look forward to no progress in aircraft construction or in the methods and material

of attack to be adopted by aircraft in the naval actions of the future, we might be content to accept the expressed views of those who regard the value of aeroplanes in such operations as very problematical. But if we go to the other extreme and predicate that aircraft are now only in their infancy—that they are only on the threshold of development, which we sincerely believe to be the case—does this not alter the point of view entirely? We submit that it does. If we regard the tremendous strides that have been made in the development of the battleship within living memory, we have some line to the corresponding development which may be expected in aircraft during the next two or three decades. It seems almost unbelievable, but it is a fact that only a week or so ago there died a distinguished naval officer who served in the first British armoured ship, H.M.S. *Warrior*. What enormous progress he saw during the span of his Service life! And what reason is there to suppose that the sum total of aerial progress during the ensuing corresponding period will be any less? None that we can see. It really does seem that more foresight, more imagination, is required from those who settle the policies of nations. They hang too much upon the past and fail to visualise the future.

• • •

Lord Weir on British Aviation

Speaking at the annual meeting of the Scottish Branch of the Royal Aeronautical Society the other day, Lord Weir said he considered the British cross-Channel air services the key of the future development of the British aircraft industry. The Government subsidy, he said, was both generous and helpful. The responsibility for development now rested on the shoulders of private enterprise rather than on those of the Air Ministry, and he trusted private enterprise would respond to the fullest degree. He had, he said, the utmost faith in the future of that industry. We were making quite sound headway in aviation, taking it all round, but advance was relatively slow on account of our financial position.

We are exceedingly glad to know that Lord Weir is so optimistic as regards the future. So are we full of faith in that future, provided the industry can steer itself safely through the rough waters in which it finds itself at present. We agree that the cross-Channel subsidy is generous enough in its amount, and that it is very helpful to the firms who are engaged in working the services. As to that, we have no word of criticism to offer. But we remain of the fixed opinion we have always expressed, that the Post Office could do a great deal more to encourage aerial transport services than it does if only it did not regard matters so much from the departmental standpoint. True, a certain amount of mail matter is sent by air, but that merely happens, as it were, because the public has demanded the extra speed of transmission which the aerial service provides. The Post Office has not created that demand; it has simply fulfilled it after it had come into being. That is not the way great businesses are built up. We put it that if the Post Office were to adopt up-to-date commercial methods and announce broadcast that it would institute regular contract mail services for the carriage of all first-class matter by air, the business would soon grow to almost undreamt-of dimensions. People *do* want speed of transmission of the written word, and they will take advantage of it if it is there. But when a great public department adopts the attitude of "we will do it when the public says we must," development is and must necessarily be slow. Of course, the British aviation industry will come through its troubles and will reach the state of prosperity to which Lord Weir referred. But it would do so much more rapidly if we had a Government which had vision. It is not subsidies that are wanted now, but business on a businesslike basis, and that the Government could assist in without costing the taxpayer, as such, a penny.

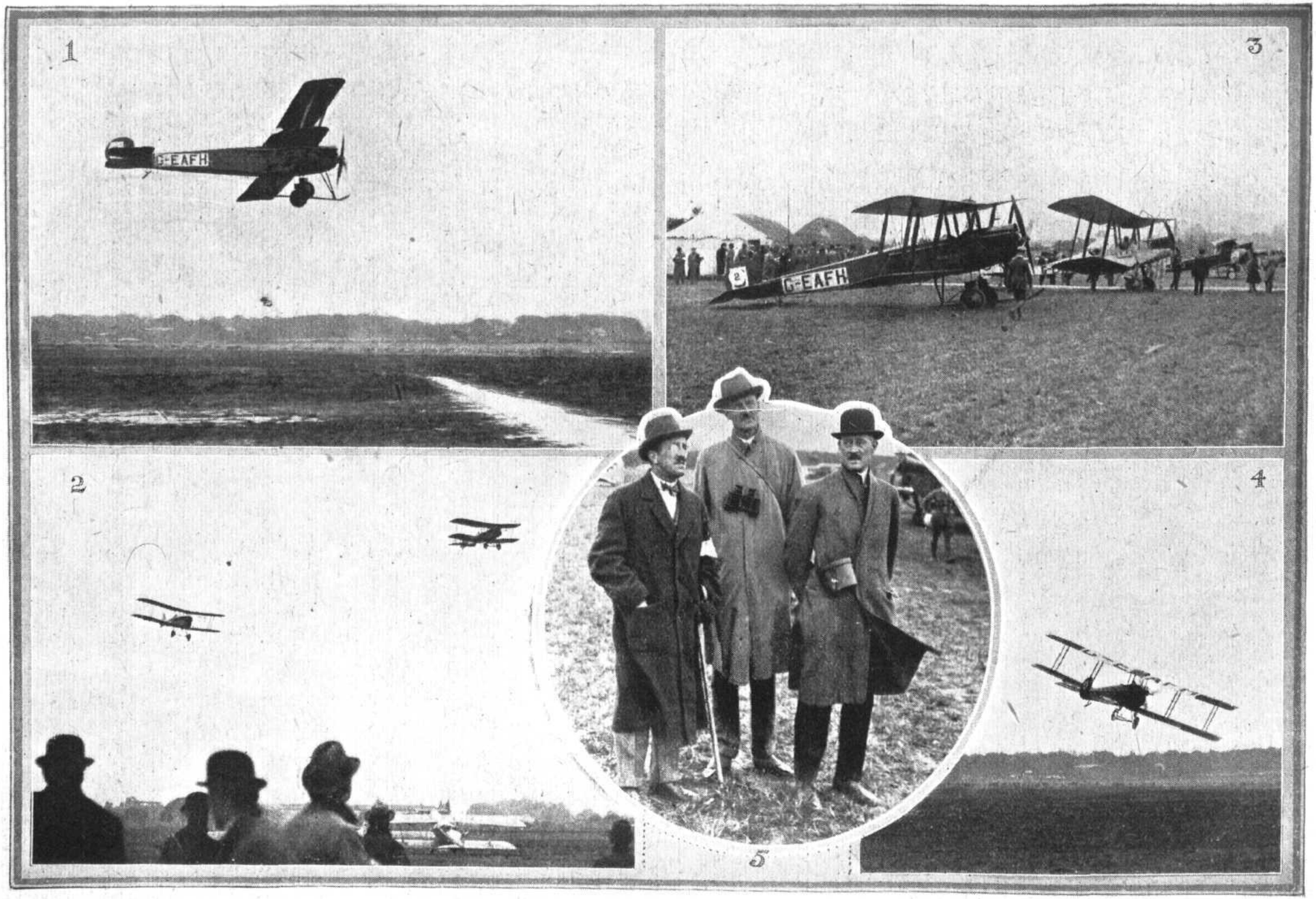
• • •

Commercial Aviation in France

In the course of an interview, M. Eynac, the French Air Minister, recently gave some very interesting facts and figures relative to the development of commercial aviation in France. He remarked that the French public, at first suspicious as to the practical value of aircraft, is at last aware of the pre-eminent importance of aviation in peace as well as in war. The development of commercial aviation, he said, has been most remarkable during recent months. There are now in operation six aerial lines for the conveyance of goods and passengers, and so far as air transport is concerned France is well ahead of all other nations. Unfortunately, we know this to be only too true. Not that we are at all envious of French enterprise. Rather do we deplore the policy of *laissez-faire* which has resulted in the unquestioned British lead in aviation which existed at the end of the War being turned into a position of almost hopeless inferiority not only to France but to that of Germany and America. It is true that Germany has nothing very much in actual operation, but we know sufficient of the plans she is making and the way she is working to know that when at last she is free to translate her plans into actual facts she will be one of the great air Powers of the world. What our own position, military and civil, will be then we scarcely care to contemplate.

However, to return to French development. After pointing out the enormous saving in time resulting from the employment of aircraft, M. Eynac remarked that a factor of paramount importance to the future of commercial aviation is that of security. On this point, he said, the results already obtained are a sufficient guarantee of the safety of passengers. During the year 1919–20, 1,900,000 kilometres had been flown by French aeroplanes. On this total seven persons had been killed and seven injured—that is to say, one death and one case of injury to every 170,000 kilometres flown. Obviously, this compares very favourably with the accident statistics of any other form of transport, and should be enough to reassure those who still regard travel by air as among the most dangerous of possible undertakings. Touching upon the actual figures, the Air Minister said that, during the year 1919, 960 persons travelled by air, while in 1920 the number of passengers carried was 6,750. This year during the month of March, which is not one of the best flying months, 665 aerial passengers were carried. The carriage of goods has increased correspondingly, for while 13,900 kilogrammes were carried in 1919, in 1920 the weight conveyed amounted to 103,330 kilogrammes. These figures will be very largely increased during the current year.

The story is really one of wonderful development, when all the circumstances are taken into account,



THE FIRST CROYDON AVIATION MEETING : (1) F. G. M. Sparks, on the Renault Avro, winning the first race. (2) Two S.E.5.'s come round on their first lap in the second race. (3) The line-up for the third event, the First Croydon Handicap. (4) Sparks takes off on a climbing turn in the third race. (5) Three of the officials : reading from left to right, Major-Gen. Sir Sefton Brancker (Chairman, Organising Committee), Brig.-Gen. F. L. Festing (Judge), and Air Vice-Marshal Sir E. L. Ellington (Steward). (*See p.* 631.)

and France is to be felicitated upon having a Government with vision and imagination enough to appreciate what aviation really means to a nation. Would that our own Government were able to regard the matter with the same eyes.

Congratulation to the R.Ae.C.

Having regard to all the circumstances, the race meeting promoted by the R.Ae.C. at Croydon last Saturday must be said to have been a great success. The Club had not a great deal of money to spend on organisation and prizes, so the number of entries received was very satisfactory, bearing in mind that flying is by no means a cheap pastime to the private individual. The racing was keen and fairly close, while the attendance of the interested public on a bleak September day, such as Saturday turned out, was excellent. All things considered, we think we are justified in referring to the meeting as a great success, and one which should encourage the Club to organise other similar events in the future.

We have always taken the line that such events as this are of almost incalculable benefit to aviation in general. As the French Air Minister said in an interview, from which we have quoted in a previous article, the disposition of the public generally is to regard aircraft with a certain amount of suspicion. The man in the street has not yet got away from the idea that if he goes into the air he takes his life in his hands. Nothing is so likely to convince him that this need not be so, and that flying is really no more risky than travel by train or boat, as the sight of aircraft in numbers flying as easily and safely as we know they do. The crowd assembled at Croydon was privileged to witness such a sight—aircraft racing against each other and landing at the end as lightly as birds with nothing that bore the slightest relation to difficulty or danger.

All such events as these are excellent propaganda, and we trust that, in view of the success of last Saturday's meeting, the Club will proceed with the organisation of others in the spring and summer of 1922.

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN SEPTEMBER 11 AND SEPTEMBER 17, INCLUSIVE

Route‡	No. of flights*	No. of passengers	No. of flights carrying Mails	No. of flights carrying Goods	No. of journeys completed†	Average flying time	Fastest time made by	Type and (in brackets) Number of each type flying
						h. m.		
Croydon-Paris	33	100	12	23	32	2 47	Goliath F-FHMY (2h. 10m.)	B. (5), D.H.18 (2), G. (4), H.P. (4), Sp. (7), V. (1).
Paris-Croydon	36	101	17	31	30	3 0	D.H.18 G-EARO (2h. 15m.)	B. (4), D.H.9 (1), D.H.18 (2), G. (5), H.P. (3), Sp. (6), V. (1).
Croydon-Brussels ...	6	4	4	3	6	2 25	D.H.4 O-BALO (1h. 49m.) ...	D.H.4 (4)
Brussels-Croydon ...	5	6	5	4	4	3 12	D.H.4 O-BADO (2h. 34m.)	D.H.4 (3), G. (1).
Croydon-Amsterdam ...	6	9	6	6	6	3 18	Fokker H-NABK (2h. 35m.)	F. (3).
Amsterdam-Croydon ...	5	9	5	5	5	3 28	Fokker H-NABK (2h. 58m.)	F. (3).
Totals for week ...	91	229	49	72	83			

* Not including "private" flights. † Including certain journeys when stops were made *en route*.
‡ Including certain diverted journeys.

Av. = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. D.H.4 = De Havilland 4, D.H.9 (etc.).
F. = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. M. = Martinsyde. N. = Nieuport.
P. = Potez. Sa. = Salmson. Se. = S.E.5. Sp. = Spad. V. = Vickers Vimy. W. = Westland.

The following is a list of firms running services between London and Paris, Brussels, etc., etc. :—Co. des Grandes Expresses Aériennes; Handley Page Transport, Ltd.; Instone Air Line; Koninklijkie Luchtvaart Maatschappij; Messageries Aériennes; Syndicat National pour l'Étude des Transports Aériens; Co. Transaérienne.

The G.B. Balloon Race.

Of the 15 balloons entered for the Gordon-Bennett Balloon Race, which started at Brussels on September 18, 14 took part in the race. The fifteenth, that of de Muyter, was obliged to abandon the attempt owing to a soldier failing to let go of the rope and being carried up with the balloon. He was hoisted on board, but with the extra load the balloon would have had no chance. There were several narrow escapes, but, fortunately, no accidents. It appears that the longest distance has been covered by Armbruster (Switzerland), who came down on the east coast of Ireland, on the island of Lambay. Distance 469 miles.

Long Tour on "D.H.9."

Piloted by Mr. Cobham, a "D.H.9" aeroplane with Siddeley "Puma" engine has recently done a tour of the capitals of Europe, covering in all a distance of approximately 5,000 miles without mishap. Mr. Harry Fox, a Paris businessman, chose this means of locomotion for a visit on business to a number of cities, and the de Havilland Aircraft Co. supplied the machine and pilot. The "air-taxi" called at the following places :—Paris, Brussels, Hamburg, Copenhagen, Stockholm, Christiania, Copenhagen, Berlin, Warsaw, Prague, Vienna, Venice and Milan, returning to London *via* Nimes and Paris. No mishap of any kind occurred.

A Wonderful Glide at Rhön

On September 5 (after the closing of the gliding competition) Martens on the Hannover monoplane glider made a wonderful flight lasting 15 mins. 40 secs. Starting from the Wasserkuppe, he alighted at Batten, near Hilders, at a point only 500 metres below his starting point. As the distance covered was 7·5 kilometres (over 4½ miles), the average gliding angle for the whole flight was 1 in 15. No doubt on certain stretches of the flight the gliding angle must have been even better. It should be remembered, however, that country such as the Rhön mountains is not to be found everywhere. This does not, of course, detract from the excellence of Martens' performance.

The Soviet Acquiring Airships

According to the *Epoca*, the Russian Soviet agent, Vorowski has purchased two of Italy's airships, which are to go direct to Moscow.

German Aeroplanes for Sale

According to the Amsterdam correspondent of *The Times*, advertisements have appeared in the Dutch Press, offering for sale 36 new German aeroplanes. The machines are stated to be equipped with 200 h.p. Benz and 120 h.p. Mercédès engines.

THE D.H. 32 COMMERCIAL BIPLANE

360 H.P. Rolls-Royce Engine

CONSTRUCTION is just about to be commenced at the Stag Lane Works of the De Havilland Aircraft Co., Ltd., on a new machine designed for commercial work. As may be gathered from an inspection of the accompanying general arrangement drawings, the D.H. 32 is a biplane following somewhat on the lines of the famous 18 which has now been in use for some three years on the London–Paris lines, where it has given excellent results. This machine was described in FLIGHT of March 24, 1921, to which issue we would refer readers wishing to trace the differences and similarities of it and of the new 32 biplane.

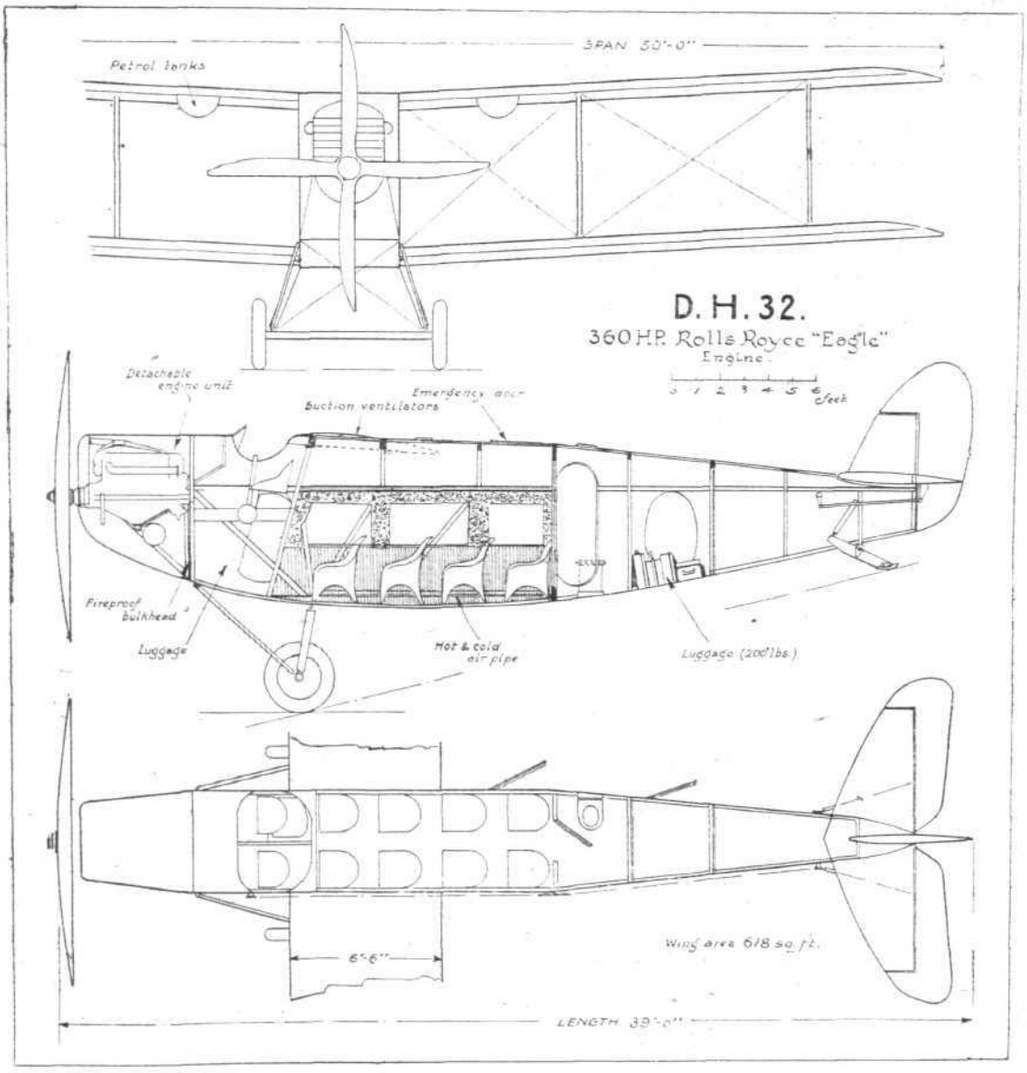
In spite of the excellent service given by the D.H.18, there are bound to be certain matters in which improvements can be effected. Three years of hard service will find weak spots (we do not mean this to be applied literally to the structure) in any machine, and bring to light features which could be improved upon, or simplified. This is actually what has happened in the case of the 32, with the result that the new machine will be very much cheaper in first cost with a consequent reduction in insurance, maintenance, and depreciation charges.

The engine to be fitted in the new machine will be a Rolls-Royce "Eagle" (Commercial) of 360 h.p., so that the fuel consumption should also be smaller than that of the D.H. 18. We are not at present in a position to quote the price at which the 32 will be sold, but it will be a very material reduction on that of the 18. At the same time, performance will not be allowed to suffer to the extent of lessening the suitability of the machine for use on the "Airways."

In general construction the D.H. 32 will follow more or less usual de Havilland practice. That is to say, the *fuselage* will be covered with ply-wood so as to avoid cross bracing, which requires attention and interferes with cabin arrangements. Also the plywood covered body has considerable flotational capacity in case of a forced descent in the sea.

The cabin will be spacious in proportion to the size of the machine. Its length will be 12 ft., and the height and width 7 ft. and 4 ft. respectively. There will thus be ample headroom, while the *fuselage* construction is such as to leave no unsightly projections anywhere in the cabin. The seats will be arranged in two parallel rows along the sides, with a passage between them. The entrance door will be on the starboard side near the aft end, and in front there will be a door communicating with the pilot's cockpit so that the navigator, wireless operator or engineer—whichever is carried in the seat next to the pilot's—can, if desired, come down into the cabin and give passengers any information that might be required, such as the decision to land at some aerodrome other than that intended, owing to weather conditions, etc. Aft of the cabin there will be a lavatory, while still farther aft a separate luggage compartment will carry some 200 lbs. of luggage. This compartment will have a separate door, so that it will not be necessary to pass the luggage through the cabin.

Large windows in both sides will give the passengers a good view, and the question of heating and ventilation has received careful attention. It is probable that the system will take the form of pressure feed air pipes running the whole length of the cabin at floor level. These pipes will have small holes in them through which the air is diffused



THE DE HAVILLAND 32 COMMERCIAL BIPLANE : General arrangement drawings, showing seating accommodation, etc.

into the cabin, while the foul air will be sucked out by special ventilators in the roof. It is well known that air sickness is mainly caused by bad lighting and ventilation, and in this respect the new D.H. 32 should go a long way towards avoiding this the only unpleasant feature of air travel in rough weather.

As in all de Havilland commercial machines, there will be emergency exits in the roof. The exact form which these will take is still a matter for experiment. It is possible, however, that they will be in the form of light frames, covered with thin white fabric. Such a window would admit sufficient light, and at the same time would not be in danger of being broken or cracked. If doped on to the roof by a narrow strip it would be easily detached in emergency.

As regards the equipment of the cabin itself, the seats will be of the light wicker work type, well upholstered, and a thick carpet will cover the floor. This carpet will be in three separate units so as to be easily removed for cleaning purposes. Should it be desired to carry cargo in place of passengers, the seats can be readily removed, when the cargo space available is 288 cubic ft. The load that can be carried will be just over 1,500 lbs. as a cargo machine, or eight passengers in the cabin and, if desired, an extra passenger next to the pilot. If we take the passenger capacity as eight only, the number for which there is accommodation in the cabin, and assume a maximum power of the engine of 360 h.p., the power expended per passenger is 45 h.p., which, it will be seen, is a very good commercial proposition. Moreover, once flying at the desired level, the engine will be throttled down to about three-quarter power, when the cruising speed is estimated to be 98 m.p.h. The power per passenger is then less than 34 h.p., which would give very good economy in running. At the same time, over most routes a cruising speed of nearly 100 m.p.h. should be ample, especially as the maximum speed will be about 110 m.p.h.

As in the D.H. 18, the engine will be mounted as a complete unit with its radiator, water and oil tanks. To remove it from the machine all that is necessary is to undo four bolts at the corners of the *fuselage*, disconnect the engine controls and petrol leads, and the whole engine unit can be removed for adjustments or repairs. One imagines that in actual use a good plan would be to have a complete spare engine unit which could be substituted in a very short time, thus preventing loss of earning capacity through being laid up for engine repairs.

The radiator will be of the "saddle" type, fitted in the nose of the machine. The oil tank will be fitted inside the engine housing and removable with it. The placing of the petrol tanks is interesting. There will be two streamline tanks placed immediately under the top plane, some little distance out from the body. By this arrangement the risk of fire in a crash is thought to be greatly reduced, while the petrol system is very simple. A fireproof bulkhead will be fitted aft of the engine. Blaisdell "Petro Flex" will be used where sharp bends or relative motion occur, so that there should be no possibility of a fractured petrol pipe.

The wings will be of the biplane form, with two pairs of inter-plane struts on each side. They will attach direct to the *fuselage* corners, as the latter is of sufficient depth to give the required gap. The pilot will be seated just in front of the leading edge of the top plane, where his view should be exceptionally good, a feature which is not always given the attention it demands in machines intended for commercial use.

In view of the success which the D.H. 18 undercarriage has had, it is not surprising to learn that a very similar, although in certain respects improved, undercarriage will be fitted on the 32. The feature of this type is the very long travel, giving good shock-absorbing qualities, and the absence of "bouncing" attained by the use of oleo damping gear. The undercarriage will be so proportioned that when the tail skid is on the ground the planes are at a large angle of incidence. The result is that the machine pulls up very quickly. This is a feature which has been amply tested out on the 18's. Another desirable feature of this undercarriage is the ease with which it can be removed by undoing four bolts.

The question of control has received very careful attention. Ball-bearing controls will be fitted throughout, as this has been found in the D.H. 29 monoplane to give exceptional ease, and thus relieves the pilot of hard work, which is of great importance in flights of long duration. Another feature which will be incorporated after trial in the monoplane is a new method of balancing the *ailerons*. A form of differential movement is obtained so that the upward movement of one *aileron* is greater than the downward movement of the opposite one. In this way not only are the *ailerons* very easy to work, but, what is perhaps of even greater importance, when near the stalling angle the *ailerons* do not have the same tendency to precipitate a spin as is the case when the lower *aileron* is pulled down to a large angle.

The following will be the main characteristics of the new D.H. 32 biplane:—Engine 360 h.p. Rolls-Royce "Eagle" (Commercial). Span about 50 ft. Chord, 6 ft. 6 ins. Area, 618 sq. ft. Overall length, 39 ft. Overall height, 12 ft. Capacity, 8 passengers, or 1,536 lbs. of freight in a space of 288 cubic ft. Weight empty, but with water, 3,412 lbs. Crew, 180 lbs. Useful load, 1,536 lbs. Petrol (68 gallons), 490 lbs. Oil, 60 lbs. Lavatory, etc., 60 lbs. Total weight, fully loaded, 5,738 lbs. Speed at ground level, 110 m.p.h. Cruising speed, 98 m.p.h. Speed all out at 5,000 ft., 107 m.p.h. Climb to 10,000 ft. in 27½ mins. Ceiling, 14,000 ft. Range, 4 hours at cruising speed of 98 m.p.h.

By Air to Spain

In connection with a paragraph which appeared in the daily press to the effect that irregular passenger services are being run from London to Madrid, it should be pointed out that these are not carried on by the machines being delivered by the Aircraft Disposal Co., nor by the Bristol Aeroplane Co., whose machines are delivered to the order of the Spanish Government. The machines in question are D.H. 9's which are being delivered to a private firm in Spain, and Lep Aerial Travel Bureau of Piccadilly Circus are handling the bookings. No attempt is made to make quick journeys, the average time taken being two days, but in case of a passenger wishing to make a rapid journey, attempts will be made to make the trip in one day. In any case the journey by air is far more comfortable than the train journey, even when there is no great saving of time.

Air Mail and Time Saving

The Postmaster-General announces that the mails for Egypt, India, etc., and Australia, which were dispatched by air from London to Paris on September 9 duly overtook the ordinary mails which left England the previous day, and have been forwarded from Marseilles by the P. and O. Packet *Narkunda*.

British Aircraft Register

The Air Ministry announces that, owing to the urgent necessity of effecting all possible economies, the Air Council have decided with regret to suspend the distribution of copies of the British Aircraft Register and of the monthly amendments thereto. The Register with amendments will, however, be available for inspection at all reasonable hours in Room 574 at the Air Ministry, Kingsway, W.C. 2.

The Accident to the Paris-Warsaw Aeroplane

It has been our sad duty to record lately several accidents to aircraft, and the list is now increased by another, this time to a French machine belonging to the Franco-Roumanian Air Navigation Company, who are operating the Paris-Strassburg-Prague-Warsaw service. It appears that the machine in question was returning from Strassburg to le Bourget with four passengers. The Paris aerodrome was approached at a good height, but on coming in the pilot, M. Henri Brosse, attempted to climb again in order to avoid another machine which was just starting off. In so doing he appears to have stalled the machine, which side-slipped and crashed into a wooden hut on the border of the aerodrome. The passengers, Mr. Kern and Mr. Marten of Strassburg, and and Mr. and Mrs. Raymond, of Saint Germain-en-Laye, were killed instantly, while the pilot succumbed to his injuries later. Up till the time of this regrettable accident the Paris-Warsaw service had run without a mishap, and had, since its inauguration in February last, carried 500 passengers, while as regards goods some 7,000 lbs. were carried in June alone.

Commercial Seaplanes

In the Engineering Section of the British Association, Sqdn.-Ldr. A. J. Miley read a paper on seaplanes, during which he pointed out that, so far, the seaplane was undeveloped for commercial use, but that it appeared to offer great possibilities. It would have to compete against relatively slow-moving surface vessels only, and consequently would not be required to have the speeds demanded of aeroplanes competing against trains. This is a view which we have repeatedly put forward in this journal.

FLIGHT

THE FIRST CROYDON MEETING

It was a pity that bad weather prevailed last Saturday on the occasion of the First Aviation Race Meeting held by the Royal Aero Club at Croydon Aerodrome, and but for this the experiment of holding flying meetings at the Croydon Aerodrome would undoubtedly have proved to be a great success. Nevertheless, in spite of the fact that at times a 40 miles an hour easterly wind was blowing and a miserable drizzle fell on and off throughout the afternoon, some quite decent racing was put up, and a fairly large attendance—said to be about 4,000—occupied the various enclosures. Given finer weather, better advertising, and certain improvements in the ground organisation—especially as regards the catering—there is every reason to hope that these meetings will become regular and popular events.

Five out of six of the items down on the programme were carried out, the sixth, the balloon sniping competition being abandoned owing to the high wind and late hour. The feature of the afternoon was, perhaps, the splendid flying of F. G. M. Sparks, of the Welsh Aviation Co., on the 80 h.p. Renault-Avro, who entered three events and obtained first place in each. The same course was flown in each event, the outside turning points being a white cross on the ground near Purley Downs Golf Club, and Beddington Cement Works—a distance of about eight miles.

Just before the first race took place, someone went up for a test flight on a D.H.6 and heading into the wind when up a thousand feet or so did a little hovering. Then Goliath F-HMFU arrived from Paris, and made an exciting landing in the gusty wind, being blown over on to her starboard wing-tip a moment before coming to rest—fortunately without any serious result.

The first event was a Club Handicap for Avros (not exceeding 150 h.p.) over two laps of the course, about 16 miles (1st prize £20). There were five entrants, as follows:—F. M. Sparks on an 80 h.p. Renault-Avro, 548 (2 mins. 12 secs.); A. F. Muir, on a 130 h.p. Clerget-Avro, 504K (51⅗ secs.); H. A. Petre, on a 110 h.p. Le Rhone Avro, 504K (22⅘ secs.); W. R. Bailey and Lieut.-Col. Spenser Grey, both on 110 Le Rhone Avros (scratch). Sparks made a spectacular get-off, banking sharply to the right as soon as he left the ground, and thus got a good lead right away. Spenser Grey's engine refused to start, and he was unable to get away. The result of this event was as follows:—1st, Sparks (time, 13 mins. 56⅘ secs.); 2nd, Muir (time 15 mins. 50 secs.); 3rd, Bailey (time 15 mins. 52 secs.).

The next event was the First Waddon Handicap for machines with a speed of not less than 100 m.p.h. over three laps of the course, about 24 miles (1st prize £30, 2nd £10). Five entered as follows:—G. H. Bowman on a Sopwith Snipe—200 h.p. B.R.2—(14⅘ secs.); H. Shaw on a 400 h.p. Liberty "D.H.9a" (6 secs.); F. J. Ortweiler, A. F. Muir, and W. H. Longton, all on 220 h.p. Wolseley-Viper "S.E.5a's" and starting together at scratch. For some reason or other the Liberty did not feel at liberty to start, and the Snipe failed to get away on the fall of the flag, so the three "S.E.5a's" got off first, with the Snipe some way behind. At the end of the first lap Longton and Ortweiler were more or less level, with Muir close behind, but Bowman was flying rather wide. On the second lap Longton crossed the line first, then Muir and after him Ortweiler, in which order they finished the third lap—their respective times being:—Longton, 14 mins. 20⅘ secs.; Muir, 14 mins. 44⅕ secs.; Ortweiler, 15 mins. ⅗ sec.

The third event, the First Croydon Handicap, for machines with a speed of less than 100 m.p.h., over the same distance (1st prize £30, 2nd £10), produced eight starters as follows:—Sparks, on the Renault Avro (3 mins. 22⅘ secs.); D. I. M. Kennard, on a 90 R.A.F. "B.E.2e" (2 mins. 15 secs.); Muir on a 130 Clerget Avro (1 min. 17⅘ secs.); Petre on a 110 Le Rhone Avro (37⅕ secs.); A. H. Dalton, on an 80 Renault "D.H.6" (31⅗ secs.); G. de Haviland on a 90 R.A.F. "D.H.6" (6 secs.); Spenser Grey and Bailey, both on 110 Le Rhone Avros, at scratch. It seemed, by this time, that the weather was getting worse, and the flyers in this race had a rough time of it—and Sparks was (no, not were, in this case) flying! As usual the latter pilot got away with a smartly banked turn, and maintained a steady lead throughout, the "B.E." droning along not far behind. Muir retained his third position until the second lap, when his place was taken by Spenser Grey, who, although having some difficulty in getting "unstuck" at the start, flew a good course. The poor "sky-hooks," or "D.H.6.s," did not have a chance with their handicaps, and were left behind right at the start. Dalton gave up after the first lap, but G. de H. on GEAWD, stuck it to the bitter (cold) end. The finish was as follows:—1st, Sparks (22 mins. 49 secs.); 2nd, Kennard (23 mins. 31 secs.); 3rd, Spenser Grey (23 mins. 55 secs.).

The fourth event was the First Autumn Handicap, 1st

THE CROYDON AVIATION MEETING: Two "Big" Constructors, Mr. F. Handley Page (left) and Mr. C. R. Fairey, watch the racing. Mr. Handley Page seeks protection from wind and rain in one of the H.P.T. overcoats, and proudly draws attention to the device thereon: "Handley Page Transport, No. 1."

prize £50, 2nd £20. This race was for the machines occupying the first three places in the Waddon and Croydon Handicaps. It was flown over the same course, but owing to the late hour and the weather conditions, the number of laps was reduced from four to two. Though brief, this was a very good race, and there were some close finishes; six started as follows:—Sparks, on the Renault Avro (6 mins. 9 secs.); Kennard, on the "B.E." (5 mins. 22 secs.); Spenser Grey on the Le Rhone Avro (5 mins. 30 secs.); Ortweiler (34 secs.); Muir (12 secs.); and Longton (scratch), on "S.E.5's." Sparks maintained the lead all through, and Spenser Grey passed Kennard on the first lap, but lost his second place to Ortweiler on the last lap. The latter pilot crossed the line 5 secs. after Sparks, but only ⅔ sec. ahead of Spenser Grey. Muir and Longton came in fourth and fifth respectively, with Kennard last.

The final event of the day was a relay team race for the Air League Challenge Cup. Three teams, Red, White, and Blue, competed as follows:—Red—Flight-Lieut. J. M. Robb ("S.E.5a"). Flight-Lieut. R. W. Chappell (Avro), and Flight-Offr. P. Murgatroyd ("S.E.5a"); White—Major E. L. Foot ("S.E. 5a"), Sqdn.-Ldr. G. H. Bowman (Avro), and Major C. H. Johnstone ("S.E.5a"); Blue—Flight-Lieut. Longton ("S.E.5a"), Capt. A. F. Muir (Avro), and F. J. Ortweiler ("S.E.5a"). The "S.E.5's" started off first and made one circuit of the course, the Red 'bus "dropping" into the aerodrome first very close in. A Red representative sprinted out to meet him, took over the baton, sprinted back and handed it to the Avro pilot, who lost no time in getting away. The Blue "S.E. 5" was the next in, a little further out on the 'drome, so that the Blue messenger had to cover a greater distance to deliver the goods. The White "S.E.5" landed a long way out, and the White runner looked somewhat red by the time he got up to the waiting Avro. The latter, however, refused to start, so the race was left to the Red and Blue teams. The Red Avro was first home, enabling the third representative of his team to get well away on his "S.E. 5," and thus win the race. It was a good race, and quite an exciting and amusing finish to the First Croydon Meeting. (*Pictures on p. 627.*)

ROYAL AERONAUTICAL SOCIETY

Rules for Election of Fellows and Associate Fellows

ALTHOUGH not possessing degree-conferring powers, the Royal Aeronautical Society is anxious that the standing of its members should be kept at the high level which one associates with an institution of this character. In the past, aeronautical engineers were recruited to a very great extent from more or less non-engineering classes, but one effect of the War was to bring into the industry engineers of very high standing, and who were specialists in an enormous range of subjects. This all to the good of the sound future development of aeronautical engineering, and in order to ensure that there shall be no lowering of the standard, the Society has draughted a set of rules for the election of Fellows and Associate Fellows which are sufficiently stringent to place those who succeed in passing the qualifications and examinations on a level at least equal to that of full Members and Associate Members of other technical institutions. The authorised abbreviations in these two grades of the R.Ae.Soc. are, of course, F.R.Ae.S. and A.F.R.Ae.S. respectively.

Fellowship is reserved for those who have reached a position of very high standing in the science of aeronautics. Candidates must be qualified for Associate Fellowship, although they need not necessarily have passed as such.

The necessary qualifications for Associate Fellowship are divided into three heads: (*a*) General education; (*b*) General technical qualifications, and (*c*) Aeronautical qualifications. The qualifications under the first head shall be matriculation at a university, or the holding of a school certificate of the "First Examination" recognised by the School Examinations Board, or an equivalent examination or status. The general technical qualification is to cover either engineering, science or mathematics. Under (*c*) the candidate shall be required to pass an examination in a specified list of subjects relating to aeronautical engineering. The first examination will be held in April, 1922, and applications must reach the Secretary not later than one month before the date announced for the examination. In lieu of the regular examination, candidates may present a thesis, paper or other contribution to aeronautical knowledge. The fees, which must accompany applications or theses, etc., are as follows: For a first entry in either part of the examination £2 2*s*., for a thesis £5 5*s*., for any subsequent entries full fee will be charged, for special examinations in mathematics £1 1*s*. Full particulars may be obtained from the Secretary, R.Ae.S., 7, Albemarle Street, London, W. 1.

Meteorology in the War

WHEN the Scottish Meteorological Society amalgamated with the Royal Meteorological Society early this year it was arranged to hold meetings periodically in Scottish centres as well as those held regularly in London. The first of these meetings was held the other day in Edinburgh, Mr. R. H. Hooper being in the chair. Several papers were read, a particularly interesting one being read by Captain Cave, who told of the part played by meteorology in the War. So far as the Army was concerned, he said, previous to 1914 there was no provision for meteorological information. They were told that the British Army did not go into action with umbrellas. In 1915, however, a meteorological section was formed to supply information to the R.F.C. At first the flying men were not in the least enthusiastic, and it was the Artillery which first made full use of the new section. Kite balloons played an important part in securing the necessary information, and were the means of saving hundreds of lives.

Captain Cave went on to tell how eventually the R.A.F. came to appreciate the work of the section and to make very extensive calls for information. He described in detail the work done in the later stages of the War at Stonehaugh in regard to ascertaining the velocity of air currents at different heights. All methods generally, he said, gave place to the use of small pilot balloons, which were sent up at various times of the day as required by the Air Force authorities. With the balloons they used the theodolite, and their experience showed that the theodolite was sufficiently accurate for the purposes of flight.

New Zealand Favours Aviation

IT is evident, from a recent statement made by Sir Heaton Rhodes, New Zealand Minister of Defence, that the New Zealand Air Board is justifying its existence. In outlining the work of the Air Board, Sir Heaton said that the Government had decided, after the matter had been thoroughly considered by the Air Board, to make provision for the development of aviation along lines which would enable the Dominion to possess civil aviation for commercial and other needs, and at the same time to provide for the necessities for aerial defence in case of emergency.

The key of the system was the Air Board, which would advise the Government on all sides of the question. On the purely defence side the function of the Board would be to advise the Government as to the purchase, rent and preparation of key aerodromes; the purchase and maintenance of war aeroplanes; and the inspection by members of the defence staff of aviation schools and their equipment; the institution of refresher courses for ex-R.A.F. pilots, so that the valuable training of these men might not be lost to the country; and the allotment of defence machines to civil companies. The survey of routes would be undertaken by officers of the Aviation Branch of the Defence Department or by any competent aviator who might be deputed by the Board to undertake the work.

As defence aviation, owing to the great cost involved, could not be developed without the development of the commercial side, the Board was also entrusted with the duty of advising how this development could best be promoted. The general lines of the Board's duty in this respect was to advise as to: (1) Companies or private individuals that might be subsidised for the conveyance of mails and passengers on approved routes; (2) the allotment by way of loan or otherwise of Government machines; (3) inspection of privately-owned machines; (4) the reservation of rights of particular companies or individuals to fly for hire within prescribed areas. The Board would make recommendations as to contracts for passenger and mail services, and such contracts would be submitted to the Minister for Defence and also the Postmaster-General.

On general lines the Board would be an advisory authority with respect to legislation regarding aviation, and would also consider and recommend in what direction assistance should be given to the Meteorological Department, with a view to equipment to meet the needs of aviation.

FLIGHT

SOME REMARKS CONCERNING SOARING FLIGHT

By L. PRANDTL.

IN our issue of September 8, we published a report of the results of the Rhön soaring flight competition, dealing mainly with the sporting side of the competition, and giving the winners of the different sections of the competition. Reliable figures relating to what is, perhaps, from the scientific point of view, the most interesting side of gliding and soaring—the rate of descent—were not available, and hence little or nothing could profitably be said concerning this aspect of the competition. That German scientists are fully aware of the possibilities of extracting energy from the air so as to prolong a glide and, possibly, turn it into a soaring flight, *i.e.*, a glide without loss of height, is amply demonstrated by the interest taken in the subject by many of Germany's leading aerodynamic scientists. That soaring is possible was demonstrated repeatedly at the Wasserkuppe, by machines attaining, during glides, heights considerably above that of their starting point. Indeed, it did not require the Rhön competition to demonstrate this, as Wilbur Wright did that as long ago as 1911, when he remained in the air for ten minutes on a glider, hovering in a wind blowing up the hill from which he had started. On the Wasserkuppe, however, a step forward has undoubtedly been made, since flights have been successfully carried out during which turns, figures-of-eight etc., were made, and considerable portions of the flights were made in a side wind and even down wind, after the machine had risen above its starting point while flying into the wind.

As it appears highly probable that the successes attained in the Rhön mountains may encourage other countries in taking up the subject—which certainly offers a vastly more useful field than the "Aviette," for instance—it seems well to establish from the beginning the fundamental aerodynamical laws upon which the theory of soaring is based, and to attempt to deduce from these the aerodynamic features which motorless aeroplanes—as distinct from power-driven machines—should have to enable them to extract the maximum of energy from the air, or, more correctly speaking, from the wind. As being one of the clearest and most concise of modern expositions of the subject, we have translated below an article by Professor L. Prandtl, which appeared in *Zeitschrift für Flugtechnik und Motorluftschiffahrt* of July 30. Professor Prandtl, as is of course well known, is head of the Göttingen Laboratory and is one of Germany's leading aerodynamic scientists. His work on the theory of air-flow around *aerofoils* is, perhaps, the most advanced yet produced, and his remarks on the subject of soaring therefore carry more than ordinary weight.

After acknowledging his indebtedness to Herren G. Madelung and A. Betz for consenting to the publication of these notes, Professor Prandtl says :—

By soaring flight—in contrast with gliding flight—is meant motorless flight without loss of height. According to the laws of the mechanics of flight, two sources of energy are available for soaring flight. One is, air currents having an upward trend; and the other is, irregularities in the natural wind. Under the latter head we can distinguish between two effective forms: (1) Great fluctuations in the strength (and also direction) of the wind, lasting several seconds; (2) The rapid fluctuation in wind direction which is commonly described as "turbulent wind." The fluctuations of long duration can only be utilised by effecting considerable changes in the velocity and height of the machine. For instance, by, in one single gust, climbing at the expense of relative velocity, and then, in the calm which follows, gliding with a downward acceleration. The procedure to follow in order to extract energy from the wind can be condensed into a simple rule: *One must attempt to equalise the fluctuations in the wind.* In so doing, the energy in the wind fluctuations is obviously reduced, and the energy of the machine increased by a corresponding amount. Thus, for instance, one must present great resistance against a gust, small resistance against a lull; in an upward current the machine must be gradually elevated to increase the pressure on the wings, in a downward current depressed to decrease the pressure.

The fluctuations of short duration, on the other hand, can be utilised without any substantial change in velocity of the c.g. of the machine. As A. Betz has shown in a very instructive article in this journal in 1912,* useful effect is available in sufficiently great fluctuations in wind direction even with rigid and non-warped aeroplane wings. With elastically mounted or flexible wings, the force obtained from changes in wind direction, if these be sufficiently great, may assume perceptible proportions. The effect may be imagined as resembling that of the so-called fish-tail propellers. This name has been used to designate an arrangement by which the waves of the sea have been utilised for the production of power. The arrangement consists of a number of flexible plates, rigidly attached with their leading edge to the sides of a ship. As the waves rise and fall the plates bend like the tail of a fish, and produce power both when bent downwards and when bent upwards.

When we now come to the question of which of these sources of energy do soaring birds make use, the answer can—at least as regards our domestic birds—only be that, if not exclusively at any rate mainly, they take advantage of rising air currents. Rising air currents are always to be found in uneven country when a wind is blowing. They are also caused over the plains by meteorological influences. For their flying practice birds naturally seek the rising air currents, and as these are frequently not of very great extent in space, the birds have to circle in order to remain in the rising air currents. By observing the soaring of birds of prey one may frequently see that they suddenly lose height and then commence to flap their wings, continuing in flapping flight until they are seen suddenly to rise. From this moment onwards they recommence to soar. They have again found their rising current which they had previously lost. The soaring seagulls near a steamer make use of the air deflected by the steamer and commence to flap as soon as, for some reason or other, they have to leave their favourable position.

That a bird intentionally makes use of gusts does not appear to occur generally. In order to do so it would have constantly to make jumps up and down, which, so far as I am aware, it has not been observed to do. On the other hand, it does not appear unlikely that many birds utilise the rapid fluctuations in the wind besides, after the manner of the fish-tail principle. Probably, however, these forces suffice in no case to cover the entire work of flying, so that the axiom "no soaring without a wind with an upward trend" can probably be accepted as correct. It might be mentioned that in regard to sea birds, each individual wave gives the wind an upward deflection, of which the birds take advantage.†

In the case of human soaring flight, all the previously mentioned possibilities of making use of the energy in the air hold good in principle. The fish-tail effect, as I will call it for the sake of brevity, may possibly be utilised by a suitable form of flexible wing-sections, although I should advise experiments with crewless (*unbemannten*) models. It is quite probable that the wind fluctuations, which such wings would be designed to utilise, might frequently not be of such magnitude as to have a perceptible effect. In view of the probably inconsiderable gain to be expected one would not like to risk the uncertainty of the flying qualities of such a flexible aerofoil, which might easily lead to a useless, or even dangerous, machine. A crewless model, on the other hand, could more easily be sacrificed.

The utilisation of great wind fluctuations is a question of the skill of individual fliers. It is conceivable now and then to extract a slight gain from these, but too much should not be expected from this source. There then remains, as the most important help to human soaring flight, air currents with an upward trend.

If it is desired to utilise to the fullest extent rising air currents, one must strive to build machines with a slow rate of descent (*sinkgeschwindigkeit*). One is then in a position to utilise all rising air currents whose vertical component is greater than the rate of descent of the machine, provided that, at the same time, the upward slope of the wind is greater than the best gliding angle of the machine. On a slope which is steeper than the best gliding angle of the machine, it is moreover possible to soar in winds whose velocity is smaller than that of the lowest gliding speed of the machine, provided the rate of ascent of the wind is greater than the rate of descent of the machine. The machine will in this case soar out horizontally into the free air and will obviously rise in doing so. It would, however, in time get outside the region of the ascending wind, but if the slope has sufficient breadth the machine can be pointed diagonally

* A Betz: "A contribution to the Explanation of Soaring Flight," *Z.F.M.*, 1912, p. 269.

† Since writing this article I find in *Physikalischen Berichten*, 1921, some notes by Everling on a work on soaring flight by E. H. Hankin (Proc. Cambr. Phil. Soc., 20 (1921), pp. 219-227), according to which soaring by turbulent wind only is said to be possible when the earth is strongly heated, as occurs in the tropics. Dr. Hankin describes observations of birds, dragon-flies and flying fish.

to the slope and pass across it at the same height or climbing slowly, the sideways displacement giving sufficient speed for soaring. This method of flying can often be observed on seagulls over the beach. Under similar conditions the method should be possible of execution by human beings.

The conditions for the smallest possible rate of descent can be formulated. To begin with, the gliding angle ϵ is given by the well known relation-

$$\tan \epsilon = \frac{c_w}{c_a}. \qquad (1)$$

Further, the rate of descent, $v_z = v \sin \epsilon$. If we observe that the weight $G = c_a F \frac{1}{2} \rho v^2$, that is

$$v = \sqrt{\frac{2G}{\rho F c_a}} \qquad (2)$$

and that, owing to the fact that the angle is small, $\sin \epsilon$ and $\tan \epsilon$ can be exchanged, we find

$$v_z = \sqrt{\frac{2G}{\rho F}} \cdot \frac{c_w}{c_a^{3/2}}. \qquad (3)$$

Therefore, for a given wing loading, the rate of descent is smallest when the well-known efficiency ratio c_a^3/c_w^2 is a maximum. We must therefore aim at the smallest possible c_w with a large c_a. This is obtained on the one hand by a large aspect ratio, on the other by avoiding all sources of extra resistance. In order to obtain a large c_a one would have to choose a deeply cambered wing section, as is usual with fast motor-driven aeroplanes. If a polar diagram is available the maximum c_a^3/c_w^2 is easily found by trial. But if one wishes to obtain the results by calculation—which has the advantage that one is not obliged to start with a previously given aspect ratio—one may for instance proceed to do so as follows :—For the range of angles of incidence considered it is frequently possible to express the change of c_w with change of c_a by an equation of the following form :—

$$c_w = A\, c_a^2 + B. \qquad (4)$$

The coefficient A is mainly dependent upon the "induced drag," which in turn depends upon the aspect ratio. As, however, the " section drag " also usually shows an increase with greater angles of incidence, this can be included in the coefficient A by writing

$$A = \frac{F}{\pi\, b^2} + A^1 \qquad (5)$$

in which, as usual, b indicates span. B in equation (4) then indicates the constant portion of the " section drag," including all detrimental resistance of the machine. The second factor of equation (3) now becomes $c_w/c_a^{3/2} = A\, c_a^{1/2} + B c_a^{-3/2}$. A simple calculation gives for the minimum of this expression the relation $A c_a^2 = 3\, B$,

whence

$$c_a = \sqrt{\frac{3\,B}{A}}. \qquad (6)$$

As will be seen, the minimum of $c_w/c_a^{3/2}$ occurs when the first portion of the resistance in equation (4) is three times as great as the second. The total c_w then becomes equal to 4 B, and consequently

$$\frac{c_w}{c_a^{3/2}} = \frac{4}{3} \sqrt[4]{3\, A^3\, B}. \qquad (7)$$

In making this calculation one must, of course, make certain that one obtains from equation (6) a value of c_a which lies within the limits for which formula (4) is valid. Should this not be possible the greatest value of c_a for which formula (4) *is* valid may be taken. It might be of interest to elucidate these calculations by a numerical example, the figures for which are taken from model tests. Assuming an aspect ratio F/b^2 of 1/10, and further $A^1 = 0{\cdot}01$, and $B = 0{\cdot}025$ we obtain $A = 0{\cdot}0318 + 0{\cdot}01 = 0{\cdot}0418$.

Thus

$$c_a = \sqrt{\frac{3 \times 0{\cdot}025}{0{\cdot}0418}} = 1{\cdot}34,$$

which figure is attainable with deeply-cambered aerofoils. c_w becomes $= 4\, B = 0{\cdot}1$. This gives $c_a^3/c_w^2 = 240$. If we assume a wing loading of 9 kg./m² (1·85 lbs./sq. ft.) we get

$$\sqrt{\frac{2}{\rho} \times \frac{G}{F}} = \sqrt{16 \times 9} = 12.$$

Thus the rate of descent becomes $12/\sqrt{240} = 0{\cdot}775$ *m/s*². If a value of c_a of 1·2 only were attainable, the other constants remaining as before, c_w would become

$$c_w = 0{\cdot}0418 \times 1{\cdot}2^2 + 0{\cdot}025 = 0{\cdot}0855,$$

giving $c_a^3/c_w^2 = 236$. As $c_a = 1{\cdot}2$ is still comparatively near the optimim value of 1·34, c_a^3/c_w^2 is thus but little smaller than the maximum value of 240. One can therefore also in cases like that just dealt with confidently use formulæ (6) and (7).

For $c_a = 1{\cdot}2$ the gliding speed v is found from equation (2) to be approximately 11 *m./s.* and the gliding angle is $0{\cdot}0855 : 1{\cdot}2 = 1 : 14$. On a wide slope of 1 : 5 the rate of descent would, by a wind of 4 *m./s.*, be smaller than the rate of ascent of the air. Soaring across the slope would, of course, require a transverse velocity of $\sqrt{11^2 - 4^2} = 10{\cdot}25$ metres per sec.

[In order to assist those English readers who are not familiar with the German system of expressing lift, resistance, etc., it might be mentioned that in the equations printed above c_w is the drag coefficient, and c_a the lift coefficient. They are converted into the " absolute " units employed by the N.P.L. by being divided by two. Thus when Professor Prandtl speaks of a lift coefficient of 1·2, this corresponds to an " absolute " lift coefficient of 0·6. The velocity is, of course, stated in metres per second, and the letter F is used to denote wing area. b denotes wing span and G the weight (Gewicht). —ED., FLIGHT.]

U.S. Air-Mail Service Being Re-organised

VALUABLE as have been the results and lessons learnt from the running of the Air-Mail Services in the United States, Postmaster-General Will H. Hays is of opinion they can be greatly improved, and has, according to the *New York Times*, determined to re-organise them with a view to operating the entire service on a sound business-like basis.

" We just want to get everything out of this service that we can," says P.M. Hays, " and that's what I hope we shall accomplish.

" The air mail service," Mr. Hays continued, " has great value, of course, but its real importance is its potentiality as a reserve for defence in case of necessity. I don't know how many people have thought of it that way or realise the magnitude of the present air-mail establishment. The service employs 55 pilots, who fly daily 6,866 miles. We have 65 planes in readiness and 35 are daily undergoing repairs. There are, more than 400 mechanics and 21 flying-fields."

Mr. Hays believes that the air-mail is one of the most potent means for the development of aeronautics for the following reasons :—

First—It requires that continuous flying be done, in summer and winter in all altitudes necessary in going from the east coast to the west coast.

Second—It develops a personnel to operate and keep up the aeroplanes and airways, which are a great national asset both in peace and in war.

Third—It necessitates a system of airways and aids to aerial navigation, which can be developed in no other way.

Fourth—It requires that an efficient meteorological service for air travel be developed, which will measure currents in the upper atmosphere, predict storms, and study these meteorological conditions for the development of aerial navigation.

Fifth—It will develop radio communication between aerodromes for the proper handling of the aeroplanes, will be able to communicate with the aeroplanes in the air as to storms, will allow communication from the aeroplanes to the ground, and, in case of heavy weather, by directional wires, will be able to guide the planes to their proper destinations.

It is estimated that the maintenance involves about 1½ million dollars a year, working in close co-operation with the War Department.

Pulitzer Race after all.

AFTER all, this race is to materialise. Originally arranged for September 10, at Detroit, it was officially declared "off" about a month ago, owing to the decision of the American Government not to let their machines take part. Now, however, Omaha, where the International Aero Congress is to take place, has taken a hand in the game, and the race is to be run off on November 3, 1921, the Aero Club of Omaha having raised the funds necessary to cover the expenses of Government participants. Bravo, Omaha Ae. C.!

The " Dauntless " Arrives in New York

ON September 16 H.M.S. " Dauntless," carrying the bodies of the Americans who perished in " R.38," arrived in New York. It was met far out at sea by an American flotilla which put out from Newport. The bodies were removed to a temporary chapel, to await burial with full honours the next day.

FLIGHT

LONDON TERMINAL AERODROME

Monday Evening, September 19

THE weather has not been at all good for flying during the week; but, with the exception of today, very few scheduled journeys have been missed.

There have been mist, low cloud, and gales in the Channel, at various times during the week. On Saturday, for instance, Dungeness reported a continuous easterly gale from 4 o'clock in the morning until 8 o'clock in the evening; but all the scheduled flights were duly carried out, though outward machines exceeded their usual times on their journeys.

The Vickers' "Vimy," piloted by Mr. Powell, occupied three hours and ten minutes on the outward trip on Saturday, while the usual daily consignment of Bristol "fighters" for Spain were having to land at Lympne for petrol.

Today there has been practically nothing doing in the way of flying. Clouds have been below 150 feet all along the route, and "visibility" as low as 50 yards in many places. The result was that, after waiting until noon, all outward "air expresses" were cancelled. No aeroplanes from the Continent reached Croydon, either; though a Belgian machine, leaving Brussels, got as far as Ostend and then abandoned its flight.

A Novelty in Goods Transport

THE K.L.M. have again provided something new in the matter of freight carriage. A party of Dutchmen who had been visiting London, and had been greatly taken by the flavour and novelty of the Lyons' "ice-bricks," decided that they would like some of these ices at a dinner they were holding in Amsterdam. The K.L.M. and Lyons' were approached, and on that particular day it was found that the Fokker monoplane would not be leaving Croydon until 1 p.m. The ice-cream "bricks" were packed in a container, which was placed in a bucket and packed round with ice; and the whole consignment arrived in perfect order at the dinner at Amsterdam while the meal was actually in progress, and in time to take its proper place in the menu.

Mr. Duke, one of the K.L.M. British pilots, has developed a new hobby. In addition to composing music, he is building model aeroplanes to compete in a model competition in Amsterdam. He tells me he has discovered a method of making 3-ply so thin that it is nearly transparent. He strips the paper from the back of Japanese veneer, and then pastes three of the resultant sheets of wood together. It would seem to be an operation requiring much patience; but Mr. Duke assures me that the models obtained fully justify this.

The 5,000 Miles "Air-Taxi" Trip

MR. ALAN COBHAM, in a De Havilland Aircraft Company's "9," arrived back from his European flight on Thursday. He covered a distance of over 5,000 miles, and visited most of the capital cities of Western Europe. His passenger, Mr. Lucien Sharpe, an American, created a mystery by withholding his name—a proceeding which obtained much more publicity for the flights than would otherwise have been the case. Perhaps that was his idea!

Although the Continental passenger traffic is still showing a slight falling off, the amount of goods carried is increasing somewhat, and the various air transport firms are now canvassing actively for more merchandise to carry. It is not, of course, expected that it will be possible to make up for the autumn and winter decline in passenger traffic by the increased amount of goods, but it is confidently expected, now, that there will be enough combined traffic to make winter services worth while.

The parcels' collecting vans of the various concerns must, to a certain extent, draw attention to the air services. The other day, for instance, passing down Ludgate Hill in a stream of traffic, I saw two Ford vans, within a few yards of one another, both with air advertisements prominently displayed as they went on their collecting rounds. Such "overlapping" as this has, however, another aspect. It is, I suppose, inevitable at the moment; but it certainly seems wasteful when the air services should be studying every economy in order to make themselves commercially self-supporting.

Mr. Barnard, of Instone's, is up and about again after his motor-cycle crash. He was at the aerodrome for the air races on Saturday. In his absence from business Mr. Game continues to "carry on" for the Instone air-line, and Mr. Chattaway has, for the time being, become "O/C Workshops," while Messrs. Powell, Robins, and Holmes fly the "D.H. 18's" and the "Vimy" to and from Paris.

Dismantling the Airship Mast

THERE is renewed activity in the vicinity of the airship mast, for the work of dismantling it has begun. The electrical gear is being torn up from its concrete foundations and carted away in lorries. "Puffing Billy" has departed, and the mooring-head is in process of being demolished. What is to be done with the 100 tons of concrete blocks sunk into the old Beddington aerodrome is still a mystery.

The Air League of the British Empire, having decided to take a film of the various activities in commercial aviation, a cinema operator was down at the aerodrome by 9 a.m. on Saturday to film the loading and starting of the Fokker monoplane for Amsterdam. The arrangements were in the hands of the *Daily Mail* Art Department, who, with their usual enterprise, seized the opportunity of doing a little propaganda on their own. Thus, before the Air League film was started, a short length was taken showing the loading of the monoplane with the regular consignment of newspapers, while the "net sale" of the *Daily Mail* was displayed prominently on the *fuselage* of the machine. It is proposed to have, in addition to the Air League film, a set of slides of "airway" activities; and both the film and slides will be loaned to the various branches of the Air League throughout the country, together with a short lecture on air transport. It is hoped that this will help to popularise flying all over the British Isles.

The Happenings on Saturday

APART from the Aero Club races, Saturday was an exciting day. On the 10.30 a.m. Instone service to Paris, the "City of London" carried Mrs. Asquith, her daughter Princess Bibesco, and Mr. Anthony Asquith as passengers. They had a very stormy journey, as the wind was "bumpy" and head on as far as Lympne.

The inward-bound Messageries Aérienne machine, a Breguet with one passenger, which left Paris at 9.40 a.m., was caught by a violent gust when manœuvring into wind prior to gliding down to the aerodrome, and had a nasty smash. The passenger, a Mr. Lambert, suffered from bruises on the ankle, but the pilot, M. Rousillion, escaped unhurt. M. Didier tells me that the machine was a "write off."

The peculiar part of the whole incident was that, though the aerodrome was literally swarming with Press photographers, who had come to photograph Mrs. Asquith, and were stopping for the races, none of them appeared to get wind of the accident, which was only a few hundred yards away, hidden behind a church and some trees.

Among the numerous pilots who are "ferrying" Bristol fighters to Madrid, is Mr. Frank Courtney, Government test-pilot. On Saturday he left with his second machine, and, as he had evidently felt lonely on his first journey, he took Mrs. Courtney with him this time. She was quite excited at the prospect of the 1,000 miles' journey.

On his last air trip Mr. Courtney obtained some wonderful photographs of Major de Havilland crossing the Pyrenees. These show a veritable sea of mist, with the jagged peaks of mountains sticking up like islands. Not at all pleasant country to fly over!

A Tale of a Parcel

MRS. COURTNEY told me an amusing story of the parcel post. When Mr. Courtney was testing the "D.H. 6" *fuselage* fitted with the experimental "Alula" wing at Brough, Yorkshire, the weather was rather cold, and he was wearing his "Sidcot" suit. This he left with the "Alula" people; but, owing to the approach of the winter months, he wrote them last week asking them to send on his "Sidcot" by post. When Mrs. Courtney was unpacking it on arrival, three mice suddenly ran out of one of the sleeves, and, on further examination, it was found that they had built a nest there. Considering the way the Post Office usually treat parcels, the mice must have had a pretty rough journey!

The meteorological arrangements on the aerodrome are, by their excellence, attracting the attention of both French and Dutch weather experts. On two occasions this week Mr. Hay, the meteorologist-in-charge, has had visits from weather officials of foreign air-ports, who wished to see "how it was done." This morning, for instance, a gentleman from Holland was immersed in the mysteries of weather-reporting for airmen, explained ably by Mr. Hay.

Mr. Leysmith, who is at Lympne erecting searchlights in order to bring that station up to night-flying standards, visited the aerodrome on Saturday. He tells me that the work on the searchlights is proceeding well. When they are finished the whole of the British section of the Continental "airway" will be equipped sufficiently for night-flying.

A report reached the air-port on Sunday that one of the pilots "ferrying" a Bristol fighter to Spain had crashed in France, and had been injured. The name was given in a cable as "Ernest Elstros"; but no pilot of this name, or anything like it, has left for Spain.

NOTICES TO AIRMEN

Italy : Aerial Lighthouses

NOTICE to Airmen No. 33 of 1920 is amplified as follows :—

1. *Aerial Lighthouses.*—The Italian Admiralty has erected and completed aerial lighthouses at the following places : San Remo, Spezia, Orbetello, Centocelle, Naples, Trapani, Catania, Taranto, Brindisi and Pola.

The erection of a lighthouse at Messina will be completed shortly.

These lighthouses do not at present work continuously, but are put into operation at the request of the Italian Ministry of War (Civil Aviation Department) or Ministry of Marine.

Further details will be published when available.

(No. 66 of 1921.)

Painting Over Inspection Stamps

1. WHEN painting aircraft, care must be taken that the inspection stamps on the parts so painted are not obliterated.

2. Ground Engineers are responsible for ascertaining that all parts of the aircraft have been manufactured under the conditions laid down in Air Navigation Directions, Section III, Paragraphs 20 and 21, and Inspection Stamps are the only evidence that these conditions have been fulfilled.

(No. 8 of 1921.)

Bristol " Tourer " and Bristol " Fighter " Aircraft : Aileron Control Pulleys

1. The existing arrangement of *aileron* pulley guards on the Bristol " Tourer " and Bristol " Fighter " type aircraft used for civil purposes is such that the *aileron* control and balance cables tend to " jam " between the pulleys and their guards, and accidents on this type of aircraft have been attributed to this cause.

2. Modified pulley guards, in accordance with Drawing No. A.D. 3329, should be fitted to all civil aircraft of the above type at the earliest opportunity.

The only new fittings required are the new pulley guard and shackle shown in the drawing, and, since the guard is split, the new fittings can be assembled in position on the aireraft over the existing cable, without it being necessary to renew the latter.

3. It is also advisable that seven-strand cable should be used in preference to four-strand cable for these and other controls.

4. Copies of Drawing No. A.D. 3329 may be obtained on application to the Secretary (C.A.L.), Air Ministry, Kingsway, W.C. 2.

5. New certificates of Airworthiness will not be granted, nor will existing certificates be renewed, unless the new type of pulley guards have been fitted to the aircraft.

(No. 9 of 1921.)

Government Aerodromes : Prices of Aviation Spirit

1. The prices of aviation spirit, given in Notice to Airmen No. 114 of 1920, are amended from August 18th, 1921, as follows :—Aviation spirit, 2*s.* 9½*d.* per gallon ; motor spirit—grade 1, 2*s.* 5½*d.* ; grade 3, 2*s.* 3½*d.* ; benzole, 2*s.* 11½*d.* per gallon. Prices in Scotland and Ireland—1*d.* more in each case.

2. Notice to Airmen No. 7 of 1921 is hereby cancelled.

(No. 67 of 1921.)

France : Aerodromes, Etc.

PREVIOUS Notices to Airmen relating to France are amplified and amended as follows :—1. *Civil Aerodrome. Bordeaux (Teynac).*—Latitude 44°50′N., Longitude 0°42′W. *Signals and Markings.*—A landing circle 50 metres in diameter has been marked on the ground in the centre of the eastern portion of the aerodrome. *An aerial lighthouse* (Barbier-Benard) has been installed in the northern corner of the aerodrome. Its characteristic signal is the letter " B " of the Morse Code, flashed every ten seconds, thus :—White light, 3.0 secs. ; eclipse, 0.5 sec. ; white light, 0.5 sec. ; eclipse, 0.5 sec. ; white light, 0.5 sec. ; eclipse, 0.5 sec. ; white light, 0.5 sec. ; eclipse, 4.0 secs.

2. *Civil Landing Grounds.*—The following grounds are now available :

(i) *Berck-sur-Mer.*—Emeregncy Landing Ground, under the control of the Service de la Navigation Aérienne.

Position.—Lat. 50°25′N., Long., 1°36′E. Situated 35 kms. S. of Boulogne, 1 km. N. of the town of Berck-sur-Mer and to the immediate west of the road from Berck to Merlimont.

Description.—Dimensions for landing, 500 metres from N. to S., 350 metres from E. to W. A wind indicator and a white circle marked on the ground will shortly be completed.

Obstructions : East side.—A road and telegraph wires. *West side.*—A ditch and certain patches of recently levelled ground. The levelled patches show up white, and, as the ground here is not yet hard, they should for the present be avoided.

(ii) *Orleans (Saran).*—Emergency Landing Ground, under the control of the Service de la Navigation Aérienne.

Position.—Lat. 47°56′N., Long. 1°53′E. Situated 4½ kms. N.N.W. of Orleans, 1½ kms. south of the village of Saran and ½ km. to the west of the main road to Artenay and Paris.

Description.—Dimensions for landing 600 by 500 metres (approx.).

There is a landing T on the east side and a white circle, 60 metres in diameter, marked on the centre of the ground, while the northern boundary, separating the landing ground from the drill ground, is marked by a white line.

Obstructions.—Work in progress on the east side renders a considerable area unfit for landing. Pilots should, therefore, land on the west side between the circle and the western boundary mark.

(iii) The following station is not at present available :—

Antibes.—Owing to work in progress at this station, no aircraft may land until further notice.

This prohibition applies equally to land and sea machine. The landing ground (aeroplanes) has not previously been notified in Notices to Airmen as it is not, in any case recommended.

3. *Military Aerodromes.*

(i) The following military aerodrome should be added to the list of those on which foreign civil pilots may land. (*See* Notice to Airmen No. 98 of 1920, Para. 1.)

Colmar—Military Aerodrome.

Position.—Lat. 48°3′N., Long. 7°21′E. (approx). Situated 4½ kms. S. of Colmar.

Note.—Owing to work in progress at this aerodrome, no aircraft may land until further notice.

(ii) *Dijon. — Meteorological Station.* — A meteorological station has now been established at this aerodrome.

4. *Marine Lighthouses.*—The following two lighthouses have now been unmasked on the land side so as to show a light all round, and be an aid to aerial as well as marine navigation :—

Cape Gris Nez.—Lat. 50° 52′ N., Long. 1° 35′E. Situated 500 yds. south of Cape Gris Nez.

A white light, flashing every five seconds, visibility 22 miles, is exhibited at a height of 233 ft. above high water from a white tower surmounting a rectangular base, 94 ft. in height.

The duration of flash is one-tenth of a second. The glare of this light may be seen in ordinary weather from a distance of 35-40 miles.

Etaples Bay (Touquet Point).—Lat. 50° 31′N., Long. 1°35′E. Situated at the South side of the Canche river entrance.

A white group flashing light, evolution every ten seconds, is exhibited at a height of 176 ft. above high water from a white octagonal tower 181 ft. high. Visibility 19 miles.

Characteristics :—Flash, 0.1 sec. ; eclipse, 2.4 secs. ; flash, 0.1 sec. ; eclipse, 7.4 secs.

5. *Previous Notices.*—The following Notices to Airmen are affected : Notice to Airmen No. 98 of 1920 (Para. 1)—Bordeaux, Colmar and Dijon ; Notices to Airmen No. 111 of 1920 (Para. 1), No. 36 of 1921 (Para. 2), and No. 54 of 1921 (Para. 2)—Antibes.

6. *Authority.*—Bulletin de la Navigation Aérienne, July, 1921, for Para. 1 and Para. 3 (ii), and French Notices to Airmen Nos. 29, 30, 33 and 34 of 1921 for the remainder (except Para. 4).

(No. 68 of 1921.)

Examinations for Aviation Ground Engineers

THE Air Ministry announces that the next examination of candidates for ground engineers' licences (aircraft and engines), under Section IV of the Air Navigation Directions, 1919, will be held at the Air Ministry (Alexandra House), Kingsway, London, W.C. 2, on Wednesday, September 28. Thereafter, until further notice, examinations will take place at the Air Ministry on alternate Wednesdays. Examinations at Birmingham, Leeds or Bristol will continue to take place monthly, as required. If necessary, in urgent cases, special arrangements may be made for examinations to be held at the Air Ministry before September 28.

FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments are notified :—

Squadron-Leader H. Gordon-Dean, A.F.C., from Inspector of Recruiting (Coastal Area) to R.A.F. Depôt (Inland Area). 5.10.21.

Squadron-Leader C. Draper, D.S.C., to No. 5 Flying Training School (Inland Area), on ceasing to be attached to Air Pilotage School. 31.8.21.

Squadron-Leader F. C. Jobson, from Palestine Group Headquarters (Middle East Area) to R.A.F. Depôt (Inland Area). 13.8.21.

Squadron-Leader J. Sowrey, A.F.C., from No. 4 Squadron (Inland Area) to R.A.F. Depôt (Inland Area). 4.10.21.

Flight-Lieut. R. A. G. Elliott, M.B., B.A., from Inland Area Aircraft Depôt (Inland Area) to R.A.F. Depôt (Inland Area). 2.9.21.

Flight-Lieut. O. St. Leger Campion, from R.A.F. Depôt (Inland Area) to No. 4 Squadron (Inland Area). 30.8.21.

Flight-Lieut. P. A. Hall, M.B., B.A., from No. 2 Flying Training School (Inland Area) to R.A.F. Depôt (Inland Area). 31.8.21.

Flight-Lieut. A. Gray, M.C., from No. 4 Squadron (Inland Area) to R.A.F. Depôt (Inland Area). 5.10.21.

Flight-Lieut. E. R. Vaisey, from No. 4 Squadron (Inland Area), to R.A.F. Depôt (Inland Area). 5.10.21.

Flight-Lieut. J. G. S. Candy, D.F.C., from Inland Area Aircraft Depôt (Inland Area) to R.A.F. Depôt (Inland Area). 5.10.21.

Flight-Lieut. S. T. Freeman, M.B.E., from School of Naval Co-operation and Aerial Navigation (Coastal Area) to R.A.F. Depôt (Inland Area). 5.10.21.

Flight-Lieut. F. Fowler, D.S.C., A.F.C., from R.A.F. (Cadet) College, Cranwell, to R.A.F. Depôt (Inland Area). 5.10.21.

Flight-Lieut. M. G. McLeary Cahill-Bryne, from No. 1 School of Technical Training (Boys) (Halton), to R.A.F. Depôt (Inland Area). 5.10.21.

Flight-Lieut. R. B. Goddard, from R.A.F. Airship Base (Coastal Area) to R.A.F. Depôt (Inland Area). 5.10.21.

Flight-Lieut. V. A. H. Robeson, M.C., from No. 4 Squadron (Inland Area) to R.A.F. Depôt (Inland Area). 4.10.21.

Flight-Lieut. F. Workman, M.C., from Headquarters, No. 11 (Irish) Wing to R.A.F. Depôt (Inland Area). 4.10.21.

Flight-Lieut. E. R. Pretyman, A.F.C., to No. 56 Squadron (M.E. Area) on ceasing to be attached to R.A.F. Depôt. 29.8.21.

Flight-Lieut. A. J. Osborn, from Air Ministry (D.G.S.R.), to Elec. and Wireless School (Inland Area). 22.8.21.

Flight-Lieut. A. Latimer, from Coastal Area Aircraft Depôt (Coastal Area) to Headquarters No. 11 (Irish) Wing. 26.9.21.

Flight-Lieut. W. S. Caster, M.C., from Central Flying School (Inland Area) to No. 2 Flying Training School (Inland Area). 21.9.21.

Flight-Lieut. T. H. Evans, from No. 3 Stores Depôt (Inland Area) to No. 4 Stores Depôt (Inland Area). 29.8.21.

Flight-Lieut. R. S. Lucy, A.F.C., from School of Photography (Inland Area), to No. 24 Squadron (Inland Area). 5.9.21.

Sqdn.-Ldr. F. L. Robinson, D.S.O., M.C., from Inspectorate of Recruiting (Coastal Area) to Headquarters (Inland Area) for " Air " Staff duties. Dated 1.10.21.

Sqdn.-Ldr. A. S. Morris, O.B.E., from M.T. Repair Depôt (Inland Area) to No. 6 Flying Training School (Inland Area). Date 7.9.21.

Sqdn.-Ldr. W. L. Welsh, D.S.C., A.F.C., from No. 14 Squadron (Middle East Area) to Headquarters (Middle East Area). Date 5.8.21.

Flight-Lieut. H. Leedham, from Electric and Wireless School (Inland Area) to Aircraft Park, Mesopotamia, for Technical (Wireless) duties. Date 2.9.21.

Flight-Lieut. J. M. Burke, to No. 267 Squadron (Mediterranean Group) on ceasing to be attached to Aircraft Depôt, Egypt. Date 12.8.21.

Group-Capt. E. L. Gerrard, C.M.G., D.S.O., from Headquarters, Mediterranean Group, to R.A.F. Depôt (Inland Area), whilst attending R.N. Staff College. 25.8.21.

Wing-Comdr. A. D. Cunningham, C.B.E., from R.A.F. Airship Base (Coastal Area) to Air Ministry (D. of E.), for Staff duties. 6.10.21.

Sqdn.-Ldr. D. Harries, A.F.C., from Air Ministry, to take over command of R.A.F. Airship Base (Coastal Area). 8.9.21.

Sqdn.-Ldr. A. G. H. Carr, O.B.E., from Marine and Armament Experimental Establishment (Coastal Area), to Armament and Gunnery School (Cadre) (Inland Area). 1.10.21.

Sqdn.-Ldr. F. C. Williams, O.B.E., from Balloon Stores Depôt to No. 4 Stores Depôt. 9.9.21.

Sqdn.-Ldr. D. G. Donald, D.F.C., A.F.C., from Headquarters, Coastal Area, to R.A.F. Base (205 Squadron, Coastal Area). 13.9.21.

Flight-Lieut. V. R. S. Humphreys, A.F.C., to No. 207 Squadron (Inland Area) on ceasing to be attached to School of Photography. 16.9.21.

Flight-Lieut. G. H. Hooper, M.C., D.F.C., from No. 207 Squadron (Inland Area), to No. 100 Squadron (No. 11 (Irish) Wing). 18.9.21.

Flight-Lieut. G. M. Lawson, M.C., from No. 5 Flying Training School (Inland Area), to Armament and Gunnery School (Cadre) (Inland Area). 19.9.21.

Flight-Lieut. E. D. Johnson, A.F.C., from Armament and Gunnery School (Cadre) (Inland Area), to Boys' Wing (Cranwell). 26.9.21.

Flight-Lieut. F. Fernihough, M.C., to No. 14 Squadron (Middle East Area), on ceasing to be attached to No. 4 Flying Training School. 5.8.21.

Sqdn.-Ldr. F. J. Rutland, D.S.C., A.M., from Headquarters, Coastal Area, to H.M.S. " Eagle." 25.9.21.

Sqdn.-Ldr. K. C. Buss, from No. 47 Squadron (Middle East Area) to Mesopotamian Group Headquarters (Middle East Area). 1.9.21.

Sqdn.-Ldr. G. W. Robarts, M.C., from Half-pay List to Air Ministry (D. of R.). 9.9.21.

R.A.F. Cadetships : November Entrance Examination

AN examination for entrance into the Royal Air Force Cadet College will be held on November 15th, 1921, and following days. The number of Cadetships open to competition at this examination will not be less than 25, inclusive of King's Cadets or Honorary King's Cadets, and will include the award of not less than one prize cadetship. Candidates must have attained the age of 17½ and not have attained the age of 19 on January 1, 1922, the only exception being in the case of a candidate who :—

(*a*) Was serving on January 1, 1920 (or who had served prior to that date) in the Royal Navy, Royal Marines, Regular Army, Royal Air Force, Special Reserve, Indian Army Reserve of Officers, Militia, Territorial Force, or in the Forces of the Overseas Dominions ; or

(*b*) Was serving on March 1, 1919 (or who had served prior to that date) in the Senior Division of the Officers' Training Corps ;

and who, in addition to fulfilling the above conditions, is recommended by his Commanding Officer as suitable in all respects for appointment to a permanent commission in the Royal Air Force, in which case the upper limit of age will be 21.

Candidates must apply in writing to the Secretary, Civil Service Commissioners, Burlington Gardens, London, W. 1, for forms of application, and the forms should be completed and returned not later than September 29th. No application received later than October 13 will be accepted under any circumstances.

The competition will be conducted in accordance with the Provisional Regulations for the Royal Air Force (Cadet) College (Air Publication 121), which may be obtained from His Majesty's Stationery Office, Imperial House, Kingsway, W.C. 2 (Price 9*d*.).

" Wakefield " Scholarship.—One " Wakefield " Scholarship will be offered for competition at the forthcoming examination. This Scholarship is part of the gift of Sir Charles Wakefield, who last year generously undertook to provide funds for the annual award of two scholarships, each value £75, for a period of three years, to assist in defraying the expenses of residence at the Royal Air Force (Cadet) College of those whose parents are in reduced circumstances. The scholarship will be awarded to the candidate, accepted as eligible by the Air Council, who passes highest into the College.

The names of intending candidates should be forwarded to the Secretary (S.7), Air Ministry, Kingsway, London, W.C. 2, not later than October 1. Each application should be accompanied by a full statement (which will be treated as strictly confidential) of the circumstances of the candidate's case. The Air Council will decide upon the eligibility or otherwise of the candidate. Preference is given where reduced circumstances are due to the late War. A King's Cadet, Prize Cadet, or a candidate nominated under Section VIII of the Provisional Regulations for the Royal Air Force (Cadet) College (Air Publication 121), will not be eligible to hold a " Wakefield " Scholarship.

CORRESPONDENCE

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

GERMAN AIR ENTERPRISE

[2043] It would seem that the restrictions of the Allies regarding the building of aeroplanes in Germany are having an encouraging, rather than a discouraging, effect on aeronautical development there. In 1903, when Wilbur Wright had perfected his glider at Kitty Hawk, he installed a petrol engine, and so evolved the first practical aeroplane. From then onwards the practice of building full-size man-carrying gliders was to all intents and purposes abandoned, all attention being directed to the production of power-driven aeroplanes modelled more or less from the Wright prototype. Although considerable advances have been made as regards speed, horse-power, and carrying capacity, there has been no great change in the form of aeroplanes since 1903, a condition which is probably due to the fact that the science was robbed by Wilbur Wright's death from typhoid in 1912. Had he lived, it is almost certain, the pioneer would have carried out many more gliding experiments, and would have proved such methods of research to be in the best interests of the science.

As it is, our late enemies, prevented from building power-driven machines, are both making sport and fostering science with the construction of man-carrying gliders. The results so far achieved are considered phenomenal even by aeronautical scientists. The fact that very fine, or flat, gliding angles have been attained is of no small significance, for the flatness of the gliding angle is the principal criterion of efficiency in aeroplanes. Of two gliders of equal weights and speeds, that which glides on a slope of 1 in 16 requires only half the power of that which glides at 1 in 8. By continued experiments with a view to reducing resistances still further, our late enemies will have most efficient aeroplanes in the course of time when they are permitted to install low-powered engines in their improved gliders

There are near London and in the provinces numerous stretches of sloping pasture land, eminently suitable for the conduct of gliding competitions, and I would be very glad to hear from any of your readers who would like to take an active and co-operative interest in fostering gliding as a sport for the advancement of science.

W. R. DOUGLAS SHAW,
Secretary to the Institution of Aeronautical Engineers

FLEXIBLE WINGS

[2044] IT seems strange to me that our designers and constructors of aeroplanes should wait for many years for the Germans to show them the means of safe and effective aviation by their experiments with gliding machines—matters that we knew perfectly well thirty or forty years ago, but when there were no petrol engines.

In my paper read before the Aeronautical Society (*see* Reports **18** 1882, **22** p. 97, **23** p. 6 and 20) it was, I thought, clearly shown, after years of study of natural flight, that the essentials of safety, etc., rested in the *light, flexible, strong* wings with Nature's *curves* of beauty, anterior parts rigid, posteriors yielding, adapting themselves *automatically* to air conditions, with reciprocating movements—wings made with *willow* planes, with Nature's graceful *curves* (so essential), reinforced with cane, *unbreakable*, each plane a *screw*, giving no chance of *nose dive* or *sideslip*—easy to go up, slow to come down ! !

Mr. Glaisher and Sir James Douglas (*see* Aeronautical Report **23**, p. 6, 16 and 20) said of my machine, which took ten years to build (1868), that it was built upon the right principles, and so did later on Pilcher, Mr. Handley Page and many others. Then why was it not done when the internal combustion engine came ? The reason seemed to be that willow with its natural *curves* is a little more difficult to work compared with pine, and takes up more time to cut and plane the curves and to insert the canes, but it would pay in the end, for you have an absolutely safe machine, one easy to go up, slow to come down.

The study of natural flight in all its bearings of birds, bats, insects, and even seed of trees and shrubs, teach at once and directly what our mathematicians work out for us on paper, which few can understand. Professor Brian told us the truth at the Society of Arts in a mathematical point of view, but, as I said then, without figures and deep and constant years of study of algebra and mathematics, we learnt directly and pleasantly from Nature the essentials of flight.

EDWARD P. FROST,
Past President of the Royal Aeronautical Society

SIDE-WINDS

"YOUR CAR NUMBER" is the title of a small folder illustrating and describing the Barimar cast aluminium number plates. These plates, as is well known, are cast plates of pure aluminium, and have the figures raised $\frac{1}{16}$th of an inch from the background, which latter is painted a dead black. As the letters are milled flat after casting, they have a particularly clean-cut appearance, and, of course, their proportions are such as to conform to all legal requirements. A copy of the folder describing the number plates may be obtained gratis on application to Barimar, Ltd., 10, Poland Street, Oxford Street, London, W. 1.

* * *

WE have before us an exceedingly interesting catalogue of "Pinnacle" Steels. These steels, as is, of course, well known, are manufactured by Messrs. R. H. Hodgson and Co. (Sheffield), Ltd., at their Sentinel works at Sheffield. The catalogue (we should have hesitated to call it such but for the fact that the publishers refer to the work under this title) forms an extremely useful reference guide to the engineer, so much more so than the usual run of catalogues, because it contains a fund of information not generally contained in publications of this nature. As the book is intended for the busy man, the compilers have had in mind that its utility must be in the ready availability of the information which is required to answer the questions which arise in the buying office and in the workshops. In addition to the particulars relating to heat treatment, and which occupy eight pages, the user has placed before him details of a selection of steels standardised in series and embodying special properties according to the particular purposes for which they have been made. The steel and tool reference—occupying five pages—is an original summary of and index to the tempers, tempering colours and steels, applicable to the very large number of different tools included. No tool manufacturer, or user for that matter, should be without one of these interesting books, copies of which can be had on application. As we have already said, the book is more than a catalogue; it is a ready reference guide to tool steels.

* * * *

New Air Line

THE Portuguese Air Navigation Co. announce a regular daylight aeroplane service between Paris and Lisbon to be run this winter. Next year the line is to be extended to London, Brussels, Amsterdam and Berlin.

FLIGHT

The Aircraft Engineer and Airships

36, GREAT QUEEN STREET, KINGSWAY, W.C. 2.

Telegraphic address: Truditur, Westcent, London.
Telephone: Gerrard 1828.

SUBSCRIPTION RATES

"FLIGHT" *will be forwarded, post free, at the following rates :—*

UNITED KINGDOM	s.	d.	ABROAD*	s.	d.
3 Months, Post Free....	7	7	3 Months, Post Free....	8	3
6 " "	15	2	6 " "	16	6
12 " "	30	4	12 " "	33	0

These rates are subject to any alteration found necessary under abnormal conditions and to increases in postage rates.

* *European subscriptions must be remitted in British currency*

Cheques and Post Office Orders should be made payable to the Proprietors of "FLIGHT," 36, Great Queen Street, Kingsway, W.C. 2, and crossed London County and Westminster Bank, otherwise no responsibility will be accepted.

Should any difficulty be experienced in procuring "FLIGHT" from local newsvendors, intending readers can obtain each issue direct from the Publishing Office, by forwarding remittance as above.